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[Reprinted from *SCHOOL AND SOCIETY*, Vol. VIII.,
No. 18½, Pages 1-11, July 6, 1918]

THE APPLICATION OF RESEARCH IN RELATING INDUSTRY AND EDU- CATION

UNIVERSAL EDUCATION AND DEMOCRACY

In another article we have endeavored to restate the reasons why democracy must support public education in general.¹ To-day added arguments are brought forth to show that those phases of education called vocational must receive increased support from the state.² From the beginning of our nation to contemporary days, when we are inaugurating the operation of the Smith-Hughes Act, there has been apparent a growing faith in publicly supported education. Practical evidences of the popular approval of universal education are seen in the facts of compulsory attendance, free tuition, and the annual expenditure of a near-billion of dollars for the support of formal education in manifold aspects. Reference to the establishment of public education was omitted from the Federal Constitution, nevertheless the relatively short history of our democracy has seen the rise of a comprehensive system of free, public education, which in operation has been approaching increasingly near to the realization of universal education. It is

¹ "Education for American Democracy," Hill, D. S., *SCHOOL AND SOCIETY*, June 16, 1917.

² Report of Commission on National Aid to Vocational Education, House Document 149, Vol. 1, pp. 18-29.

true that units of administration remain in an experimental and unsatisfactory condition, as witness the contrasting town system of New England, the township of Indiana, the county organization of the South and West, and the obsolescent but potently obstructive and very common district organization of school control. State constitutions and court decisions have made clear enough the fact that the state is the unit of educational administration. Nevertheless, we find practises variant in the matters of form and of powers of state boards of education, the relation of these boards to boards of regents, to local boards, and to the subordinate divisions of educational administration within civil divisions, districts, counties and cities. These differences in administration—wherein may be found often a confusion of the legislative, executive, inspectorial, supervisory and investigatory forms of control—constitute but one group of difficulties which confront efforts at educational progress. The rapid changes, and the unrest and the ferment, even before the war, may be interpreted as necessary steps toward enjoyment of genuine, universal education, by which we mean an education that is for the benefit of all the people, including persons of all ages, races, both sexes, different grades of intelligence, persons in all occupations—an education that balances the demand for adjustment to individual differences with the need for observance of the good of society. This kind of education inculcates both knowledge and also skill. It places in sane perspective the historic ideals, of knowledge, of discipline, of culture, of utility,

of citizenship, of happiness, of natural development, of perfection, etc., making of the list a series of goals to be stressed appropriately for time, place and individual; a hierarchy of ideals, aims and purposes, to be subordinated to the general motive of wholesome individualism compatible with altruism.

OCCUPATIONAL TRAINING

As a phase of universal education, as well as to meet the dire exigency of the hour, emphasis is being urged to-day upon the education of workers for and in the common occupations of life. There have long been provided the means of training lawyers, doctors, ministers, engineers, musicians, teachers, etc. (members of different professions who constitute altogether about five per cent. of all the gainfully employed),³ but for the common occupations of the mechanical and manufacturing occupations, of home-making, of personal service, of clerical callings, and of transportation on land or sea—the public means have been inadequate, especially since the decay of apprenticeship and of the gilds, and since the growth of the factory system. Notwithstanding the marked progress of the public high schools, during the year 1915 the percentages of students in certain studies were as follows: Domestic economy, 12.9; agriculture, 7.2; industrial training, .8 of one per cent. Contrast with these figures: Rhetoric, 58.4; English literature, 55.8; algebra, 48.8 per cent.⁴ Both corporations and also unions have felt the

³ U. S. Census, 1910. Population, Vol. IV., p. 40.

⁴ U. S. Education Report, 1917, Vol. II., p. 12.

need of specific vocational training for profitable employment, and have erected many schools to this end. Private enterprises and correspondence schools conducted for gain have profited by the demand for occupational training. Too frequently the goal of efficiency interpreted as "more work and more products for less total expenditure for wages" has been the aim, where occupational education has not been under the unitary control of public, educational authority. Occupational training that is consistent with the ideals of universal education for democracy can not exploit youth. Special provisions within our public schools, different from the existing courses of study, shops, methods and teachers, must be provided for occupational classes, during certain hours, semesters, or years, but prospective and present industrial workers are to be men and citizens as well as skilled wage-earners, and, therefore, abundant access or opportunity for enjoyment of both general and also of liberal education somehow should be made possible during the preparation and work-career of every individual.

INDUSTRIAL AND EDUCATIONAL RESEARCH

The recent passage of the Smith-Hughes Act is a splendid achievement, not without dangers, toward public control of occupational training below college grade.^{5, 6} It brings millions of dollars to aid the respective states in adding provisions for education in trades and industries, agriculture and home-making. An unusually signifi-

⁵ Federal Board for Vocational Education, Washington, D. C., Annual Report, 1917, p. 32.

⁶ Statement of Policies, do., Bull. 1, 1917, p. 70.

cant feature is the setting aside of \$200,000 annually for the Federal Board, to be used chiefly for educational and industrial research. Occupational research has also grown by leaps and bounds during recent weeks in the matter of the selection of recruits, the testing of prospective officers, etc., for our Army by means of psychological tests.⁷ Many industrial studies have been made of late for the purpose of emergency training for electricians, telephone repairmen, linemen, cable splicers, machine-shop occupations, blacksmithing, sheet-metal working, pipe fitting and for the vocational rehabilitation of disabled soldiers and sailors.⁸ During recent months or years, industrial surveys for educational purposes have been made in Richmond, Va., Minneapolis, Minn., New Orleans, La., and Indianapolis, Ind., Cleveland, Ohio.

Contemporary with some of this activity there met at Atlantic City during February the National Association of Directors of Educational Research for discussion of thirteen published reports dealing with the measurement of educational products. Through the commendable efforts of Professor Guy M. Whipple, the National Society for the Study of Education has made possible the publication of this the first volume of reports of the National Association of Directors of Educational Research.⁹ The active secretary, Mr. George M. Melcher, of the Association of Directors, has suc-

⁷ Psychological Examinations at Army Cantonments, SCHOOL AND SOCIETY, October 27, 1917.

⁸ Bulletins 5, 8 and 9. Federal Board for Vocational Education, Washington, D. C., 1917.

⁹ Seventeenth Yearbook, National Soc. for the Study of Educ., Part II., 1918.

ceeded in welding a strong interest in this movement. After reading the studies of statistics by Buckingham, of methods of measurement by Thorndike, of organizations for measurement in cities by Ballou, and other excellent articles, one is struck by the notable omission in this first volume (except by bare references in a bibliography) of other kinds of measures for education such as researches in industries with reference to education, of the types of the Minneapolis, Indianapolis, Richmond, Va., or New Orleans studies of industries and of schools. Perhaps the National Society will stress these kinds of educational research later in another report, as well as studies in finance of the type being made by Talbot in California, and still other kinds for practical use for the schools. Separate volumes could be devoted well to these latter phases of educational research. The problem of relating industry and education safely and efficiently, for individual and for society—is one great problem of the hour. Valuable are measurements of school achievement in arithmetic, reading, spelling, etc., but the relative importance of the possibilities, and of the results, accruing from the use of any known devices for such measurements may be easily exaggerated. They appeal to progressive superintendents, and also to a certain type of politically minded, timorous superintendent, who does not crave a rigorous examination of matters of administrative organization, control, finance, costs, or of adjustment of the schools to industrial and social needs. Studies of arithmetic, reading and spelling, interest teachers and the public, but they may divert attention from vital issues. In a time like this we

should think twice before making a local or a national problem of minor points in educational administration.

We observe that in the industries and in public life there are men who overlook the major successes of our public schools, and who either assert dogmatically the wholesale failure of the elementary schools, according to the criteria of their own horizon, or else are indifferent. One could easily tabulate an inventory of problems that urgently invoke a serious cooperation of good citizens for education, whether they be schoolmen, onlookers, or men in industry. In the meantime, sound judgment prescribes a firm foundation of facts of many kinds in the execution of plans for relating rightly the schools to industry, and industry to the schools. Preconceived ideas in places high or low, partisan debate and verbiage, instead of fair trial and methods of experimentation, or observation under controlled conditions, will ultimately give large place to the preliminary application of scientific methods to the study of the educational and industrial problems at hand, if we are to effect the right interrelation between education and industry—an effort fraught with perils. It is not to be overlooked that while the special, legitimate interests of groups are to be equitably conserved, *e. g.*, of teachers, of employers, and of employees—nevertheless the implications of universal education point directly to the welfare of society as our chief end. The schools do not exist merely in behalf of the teacher-group, they must not be allowed to serve for the special advantage of employers and corporations, or of employees and unions. Efficiency and

material benefit will accrue to all concerned from wise and impartial use of a ballast of facts in navigating many an educational shoal.

THE PROGRESS OF RESEARCH IN EDUCATIONAL ADMINISTRATION

Research is to be credited with scores of achievements in the fields of chemistry, physics, medicine and invention. Accumulative, cooperative efforts at research have resulted in accelerated progress of science during the past fifty years. Only when wrong ideas and aims have prostituted science, when high technical skill is united to ideals of the cave man, as in the case of the Prussian Kultur as practised, does human welfare fail of betterment when research advances. Banishment of ignorance, superstition, disease, pain and fear; control of fire, heat and electricity—these conquests are the results of research. Endowments, foundations, universities, governments, and states in manifold ways have supported and encouraged research. Its beginning is more remote than Aristotle and the end of its enlargement is not in sight. It is strange that in the field of pedagogy men have been slow to recognize the power of research. We have heard much of education as preparation for life, or as an aspect of life, nevertheless the schools actually have been remote from life, and pedagogues in many instances have meager vision and little contact with life beyond the sphere of strictly school or university activities. The greater world pulses with the impetus that has come from research affecting industry, hygiene, economics. Contrary to inertia and

retarding tendencies toward educational research, happily there are also contemporary movements which mark its rapid advance. Industrial and educational commissions have made serious studies for education. More than a hundred cities, in greater or less degree, have been subjected to a scientific procedure in the study of educational problems, *e. g.*, Richmond, Springfield, Portland, Indianapolis, New Orleans, Cleveland and Minneapolis. Numerous states also have undergone a similar process. In a dozen cities there are now permanent provisions for educational research. The Federal Government has made generous provisions for research in many departments and bureaus, and has recently provided the aforesaid special fund for the purposes of educational and industrial research under the auspices of the Federal Board for Vocational Education. It is becoming recognized that as industry has improved its processes, products and efficiency, through adoption of research as a guide, so also organized education can profit hugely by reliance upon the method of research in the solution of its administrative problems, as well as in academic questions. Examples are multiplying of applications of the scientific method¹⁰ to the solution of questions about statistics, child-accounting, exceptional children, measurements of school achievement, methods of instruction, economical methods of learning, finance¹¹ and vocational education.¹² Especially in the

¹⁰ Ayres, L. P., Summary Volume, Cleveland Survey, 1916, 363 p.

¹¹ Cubberley, E. P., "Measurements Applied to School Financing," *Indiana University Bulletin*, February, 1917.

enlargement of industrial education, research is functioning markedly.

In primitive times men vaguely relied for personal adjustment to career or occupation upon magic, incantation, ceremony, charm, or luck.¹² There was also dependence upon uncontrolled fate—hence astrology, palmistry, fortune-telling and phrenology. A more modern tendency is toward abiding faith in acquired individual ability for occupational adjustment, an ability to be obtained for the masses through the process of elementary education. Highly specialized abilities for the few are to be acquired in professional schools as in engineering, law, or medicine. The American people have strongly believed in the occupational efficacy of elementary, general education. Common sense, and our experience with pauperism, gross ignorance, disease and vice, add to this faith in the essential benefits of universal elementary education. Illiteracy, lack of knowledge, of skill, and of civic sentiment are inimical to democracy. In addition to reliance upon conventional elementary training, there has been a period of enthusiasm for various forms of manual training as to aid to ultimate vocational adjustment. Manual training has flourished upon different underlying theories, such as are indicated by the phrases: “Disciplinary training of mind through hand and eye;” “a means of expression;” “for social values—as interpreting art and industry within the schools;” “as basis or foundation for industrial education;” etc. Still

¹² Vocational Survey of Minneapolis, U. S. Labor Bulletin 199, 1917.

¹³ Hollingsworth, H. L., “Vocational Psychology,” N. Y., 1917, 308 p.

another addition to the older, elementary, general training is the custom of visits to factories, plants and farms, and the practise of inviting speakers to address students upon vocational topics. These efforts were encouraging signs of the stirring of dry bones, but are insufficient to solve the problems of articulating industry and education.

There is a fallacy in the assumption that to offer the children of a people free, elementary education, and some knowledge of vocational opportunity, is entirely sufficient for accurate and healthful adjustment of the masses to occupation, or for the right interrelation between activities of the school and of industry. We have proceeded a little further than faith in this assumption, which, it is true, is a belief far in advance of easy credulity in magic, or fate. To bare elementary training and its recent elaborations we have added specific, vocational training, for acquisition of knowledge and of skill, a training suitable for both prospective workers, and also for workers in industry, and one to be outlined after scientific study of the specific processes and conditions encountered during these present times of new and changing industrial conditions. Steering clear of a new phrenology, we also recognize the fact of individual interest and capacities, and are cautiously devising scientific means for ascertaining more definitely the capacities and interests of the individual, along with our detailed scrutiny of industry and different occupations, which occupations may be found worthy of encouragement or of opposition upon the part of organized educational forces. This recent advance in

our method of attack upon the problem of mutual adjustment of occupations and of education, of school and of society, is dependent for its outcome upon the success of research, always fundamental in human progress.

SCIENTIFIC METHOD BETTER THAN DEBATE 4

Agriculture, trades, industrial operations and processes, commerce, home management, and domestic science—undertakings of general import for living, offer unnumbered and unanswered questions that can more profitably be attacked by the truth-seeking method of research than by debate, oratorical tournaments, or philosophical speculation. It is sometimes necessary in communities given to these latter kinds of attack upon difficulties of education to insist upon a laborious application of systematic observation, fact-gathering, and cautious deduction, in order to proceed practically to the more obvious and right steps in the introduction of industrial education. For the purposes of the present brief paper it will suffice to indicate a group of frequently encountered problems which men both in the schools and also in industry, who are interested in educational reorganization, might analyze by the elementary principles of research.

(a) *Occupational Distributions*.—Enthusiasm to provide in the schools new shops, courses, and instructors for a specified vocational training may ignore the percentage distributions of occupations as estimated for the local community or for the country at large. A simple statistical accounting of community occupations as a preliminary step in the consideration of

prospective courses would prevent much waste in erection of courses not needed and promote courses greatly needed.

(b) *The Complexity of Industries.* The naive conception that a name for a trade, or industry, denotes a single occupation or even the same thing in different places and at different times is destroyed by a local, first-hand study of an industry and of the occupations therein. For example, in Richmond, Virginia,¹⁴ the metal-working industry contained these occupations (and more): Puddler, heater, roller, wood pattern maker, iron moulder, brass moulder, core maker, machinist, blacksmith, boiler maker, tin-smith and sheet-metal worker, riveter and buckler, pipe fitter, car refiner, railway car painter, machine wood worker, etc. In one saw and planing mill of moderate size studied by the writer,¹⁵ three scores of occupational designations were found, *e. g.*: Binders, blacksmiths, bolters, block pilers, bundlers, carpenters, checkers, counters, carriage men, doggers, setters, sawyers, feeders, filers, floor cleaners, foremen, dinky operators, edgermen, engineers, gatemen, knee bolters, knot sawyers, lath loaders, laborers, log deck men, machinists, markers, matchers, millwrights, mule boys, off-bearers, packers, pond men, scalers, sharers, shorts men, slashers, sorters, spalt pilers, stable men, stake cutters, switchmen, tallymen, teamsters, timber jump saw operators,

¹⁴ Vocational Education Survey of Richmond, Va., U. S. Labor Bulletin, 162, 1916, 333 p.

¹⁵ "Industry and Education, A Study of Manufacturing Establishments of New Orleans and Mechanical Occupations of Boys and Men with Reference to Education," D. S. Hill, Commission Council, New Orleans, La., 1916, 409 p. ill.

transfer men, trimmer men, watchmen, wheelwrights, wood pilers, yard tram track workers, etc. Similarly, in the printing industry there may be found these occupations of printers: Hand compositor, linotyper, monotypers, stereotyper, proof reader, makeup and stonehand, cylinder pressmen, press feeder, steel and copper plate engraver, plate printer, die stamper, packer, lithograph engraver, transferrer, lithograph pressman, lithograph press feeder, photo-engraving operator, etcher, router, photo-engraving finisher, bookbinder, forwarder, finisher, cigarette bookmaker.

(c) *Thousands of Occupational Designations*.—Misconceptions concerning the specialized nature of modern industry and the diverse conditions which confront the majority of our youth, about half of whom leave our elementary public schools without entering the doors of a high school, might be further dissipated by merely reading the enumeration of thousands of occupations designated by the United States Census. These occupations are grouped within the great fields of industry, as: Agriculture, Extraction of Minerals, Manufacturing and Mechanical Industries, Transportation, Trade, Public Service, Professional Service, Domestic and Personal Service, Clerical. The schoolman is fortunate who avails himself of the fruits of research in learning for purposes of education the necessary facts about the occupations of his own community and of the whole country. It is probable that multiplication of unit courses for wage earners will shortly appear. Experience has made possible the listing of scores of well-conceived unit courses in numerous industries, but these

courses can not be accepted as ready made for any conditions. Careful studies must be made and workers and employers be consulted in each community before attempting practical applications of the outlines listed.¹⁶

When drawing up a program for a trades school in a medium-sized city, the writer was urged rather vehemently by a business man to recommend the setting apart of a room, laboratory, and equipment, and the employment of an instructor and assistant for the purpose of training students in tile laying, which was the visitor's own business. Brief investigation showed that six tile layers could attend to all of the work of that nature in the city. There was an abundance of workers, and wages were low in this trade. Furthermore, in other occupations there was scarcity of workers, and of skill, and wages were relatively attractive. It was recommended finally that these latter occupations should be given preference in the trades school, and analyses of the occupations were made to this end.

(d) *Analyzing an Occupation for Education*.—The procedure in making such analyses varies with conditions, but a good illustration of value to students unacquainted hitherto with the methods of industrial research for education is found in the steps followed by the staff of the Richmond (Va.) Survey, an undertaking completed jointly by the U. S. Bureau of Education, U. S. Bureau of Labor Statistics, The Sage Foundation, The National So-

¹⁶ "Short-Unit Courses for Wage Earners and a Factory School Experiment," Bull. 159, 1915, U. S. Bureau of Labor Statistics, 93 p.

ciety for the Promotion of Industrial Education, and local boards.¹⁷ The steps will be indicated here in brief form, it being understood that the identical steps and questions were used for each occupation of the main, selected industries of that city. The steps, or points of inquiry, are set forth under nineteen topics and questions, as follows:

1. A description of the process, operation, movements, etc., in the specific trade or occupation under observation.
2. Products or specialties.
3. Importance of trade.
4. Conditions of employment, (a) involving physical or nervous strain, (b) stimulating intelligence and interest, (c) narrowing and restricting mental development, (d) affecting welfare of workers, as liability to accident, or disease.
5. Wages: Piece rate, daily average, apprentice, journeymen, etc.
6. Hours of labor: Regular, per day, per week; on Saturday.
7. Seasonal activities: Busy season, slack season, fluctuations.
8. Extent to which workers are organized.
9. Entrance age.
10. Time required to learn operations.
11. Age of maximum productivity.
12. Is supply of labor adequate, and cause of any deficiency?
13. Demand for this labor decreasing, or increasing?
14. What is the source of supply?
15. What does a worker need to equip him properly for this trade? (a) General education, (b) trade and technical education, (c) manipulative skill, (d) other requirements, as accuracy, etc.
16. What does the industry give the worker? (a) Provision for systematic instruction of apprentices? (b) Any trade and technical knowledge imparted? (c) Manipulative skill? (d) Extent to which operations can be learned in the factory? (e) Line of promotion?

¹⁷ *Ibid.*

17. Common deficiencies of workers?
18. What school ought to give prospective worker before he enters the shop?
19. Suggestions from the trade as concerns part time and evening courses?
 - (1) What can school give after worker enters shops?
 - (a) Of trade and technical knowledge.
 - (b) Manipulative skill.
 - (2) Nature of continuation courses needed?
 - (3) Nature of evening-school courses needed?

If one contrasts the procedures followed in Richmond, in Cleveland, in Minneapolis and in New Orleans, during recent surveys, there will be found points of marked difference in procedure from the above analytic process. How far this process is superior to naïve assumptions regarding the general nature of mechanical occupations, and the needs, is apparent. The above outline exhibits a score of problems inherent in almost every occupation to be studied for education.

SPECIAL SCHOOL PROBLEMS

Within the schools there are also certain special issues peculiarly related to industrial and economic questions. These school problems therefore demand careful study, contemporary with the analysis of occupations outside of the schools. Three examples of such school issues follow:

(a) *Elimination*.—The early quantitative studies of Strayer, Ayres, and Thorndike showed that the vast majority of children who enter the first grades never enroll in college, never pass through the high school, and that about one half never go further than the eighth grade. No one knows the actual rate of elimination from elementary and high schools. It varies

markedly in different schools. The latest estimate of the U. S. Bureau of Education is that out of 1,000 pupils who entered the first grade in 1906-07, about 117 will graduate in 1918.¹⁸ The causes of this failure of the schools to hold, involve consideration of the interests of pupils, defects in the schools, economic conditions, poverty, child labor, factory inspection, continuation schools, etc. The later quantitative studies of Van Denburg,¹⁹ of Railey²⁰ and of Holley,²¹ mark a beginning in this type of re-

(b) *Retardation*.—The majority of school reports referring to the subject speak of all school children as being divided into three groups, namely: (1) Retarded, (2) normal age, (3) under-age. The distinctions are purely artificial, and are based upon the false assumption of uniformity of development with chronological age. Consequently, industrial investigators have sometimes followed the cue and have written ambiguously of "retarded" children. The true groupings, if chronological age is to be regarded, are ninefold: (a) *At-Age*, with (1) usual, (2) slow, or (3) rapid progress; (b) *Over-Age*, with (4) usual, (5) slow, or (6) rapid progress; (c) *Under-Age*, with (7) usual, (8) slow, or (9) rapid progress.

(c) *Prevocational Courses*.—The present movement to reorganize secondary educa-

¹⁸ U. S. Education Report, 1917, Vol. II., p. 8.

¹⁹ "Causes of Elimination of Pupils from Secondary Schools," Van Denburg, N. Y., 1912.

²⁰ "Practical Studies of Elimination," Mary L. Railey, Public Schools, New Orleans, 1915.

²¹ "Relationship between Persistence in School and Home Conditions," C. E. Holley, Fifteenth Yearbook, Nat. Soc. for Study of Educ., Part II. search.

tion into junior and senior high schools encounters confusion in programs for "prevocational" education and in the professed aims and methods offered in the differentiated program of the junior high school. Here is a field demanding clear thinking based upon arrays of fact, rather than upon speculative opinions and diverse interpretations of concepts.

STANDARDIZING PROCEDURE IN INDUSTRIAL AND EDUCATIONAL RESEARCH

Beginners in this work are prone to rely upon easy, statistical computations or upon the use of questionnaires, or upon compilations of the thoughts and writings of other workers. This kind of thing also appeals not infrequently to students who like sedentary work, attention to clerical details, or burrowing in libraries for second-hand materials.

Experienced investigators have learned that the procedure in studying an industry and its contained occupations for purposes of education is a complex undertaking and requires prolonged, first-hand experience in the field. It demands contact with industry, establishments, plants and workers. A standardized procedure has yet to be developed. It is questionable whether there will ever be a "standardized procedure." ~~More~~ More do we need men and women trained in scientific methods and imbued with zeal for research combined with courage and sanity, who can formulate methods of study suited to the difficulty and situation. C. A. Prosser, now director of the Federal Board for Vocational Education, stresses the value of work designed

to culminate in an actual *program* for vocational education, rather than in a mere *portrait* of existing conditions.²² It is realized that if educational research is to be made quickly practical there must be more than the mere getting of facts. There are at least four classes of related activities, or steps, needful to make educational research practical. They are:

1. The accurate *getting* of the desired facts by researchers.
2. The careful *consideration* of the facts by boards and by superintendents.
3. The prompt *publication* of the facts upon mutual agreement of researcher, boards and superintendents for the benefit of the people.
4. Appropriate *action* where consideration of facts reveals the necessity for remedial action.²³

A COMPLETE SURVEY, INDUSTRIAL AND EDUCATIONAL

We may now venture to suggest that the complete educational "survey" of to-morrow will include the necessary data concerning the following six types of studies for a given community:

1. *The Community Background*.—Important historical, topographical, climatic facts. General drift of population. Industrial tendencies, social and moral characteristics.

²² C. H. Prosser, "Organization and Methods of the Survey," Bulletin 22, 1916, Nat. Soc. for Promotion of Industrial Education, pp. 85-95.

²³ "Meeting the Demand for the Practical in Educational Research," David S. Hill, *Educational Administration and Supervision*, November, 1916.

2. *The Existing Schools*.—General facts. Administrative organization and control. buildings and plants; equipment; finance; child-accounting; teaching staff; supervision; programs, courses of study, measurements and standards of achievement in school subjects, etc.

3. *Studies of Uses of Spare Time*.—

(a) Public provisions for recreation.

(b) Philanthropic provisions for recreation.

(c) Commercialized recreations.

(d) Routine of twenty-four hours in the life of workers in given occupations.

4. *Studies of Industries and Occupations*.—(See above, “analyzing an occupation,” etc., (d) under Progress of Research, for a complete analysis.)

5. *Comparisons* with results of studies in other cities, states, etc.

6. *Constructive Suggestions, or Detailed Plans*, for the modification both of industries and of schools, for the purposes of occupational and social adjustment.

THE VALIDITY AND KINDS OF RESEARCH

Critics assert truly enough that some of the recent efforts at educational research are of doubtful scientific validity. Truly crude, also, were pioneer efforts in chemistry (the successor of alchemy) and in astronomy (the successor of astrology). Educational and industrial research, however, has progressed further than the primitive state. The failure of enthusiastic support by some schoolmen is the result not merely of certain weak attempts, but it may be due also to failure of critics themselves in defining and evaluating clearly



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the nature and aims of scientific research.

Types of Research.—In general, research is penetration to the frontier of knowledge in one direction—and going beyond. There are, however, many types or phases of research, and contributions or reports upon researches may be such as these: (1) A new discovery or invention; (2) disclosure of errors in existing doctrines; (3) novel application of an established principle; (4) verification; (5) description of a new case under an old rule; (6) a good hypothesis.

Forms of Reports.—Research workers in any field might well look with care to the form of presentation and organization of a report.²⁴ The writer has examined data from graduate students, which were products of grievous toil and intrinsically valuable, but so confused, illy organized were the reports, that they were valueless to the reader. One has a right to expect that the (1) subject of a research should be clearly stated; (2) the scope and aims shall be clearly defined and restricted at the outset; (3) the materials used, and the procedure in making the study, should be described; (4) the data, including tables, graphs, accompanying explanations, etc., should constitute the body of the report, and objective facts should be kept separate from statements of personal opinion; (5) if a summary and conclusions are included, unusual precision and succinctness of statement are desirable; (6) the references or bibliography should be relevant. Finally, (7) a brief analysis or table of contents should constitute a first page.

²⁴ “Experimental Education,” F. N. Freeman, N. Y., 1916.